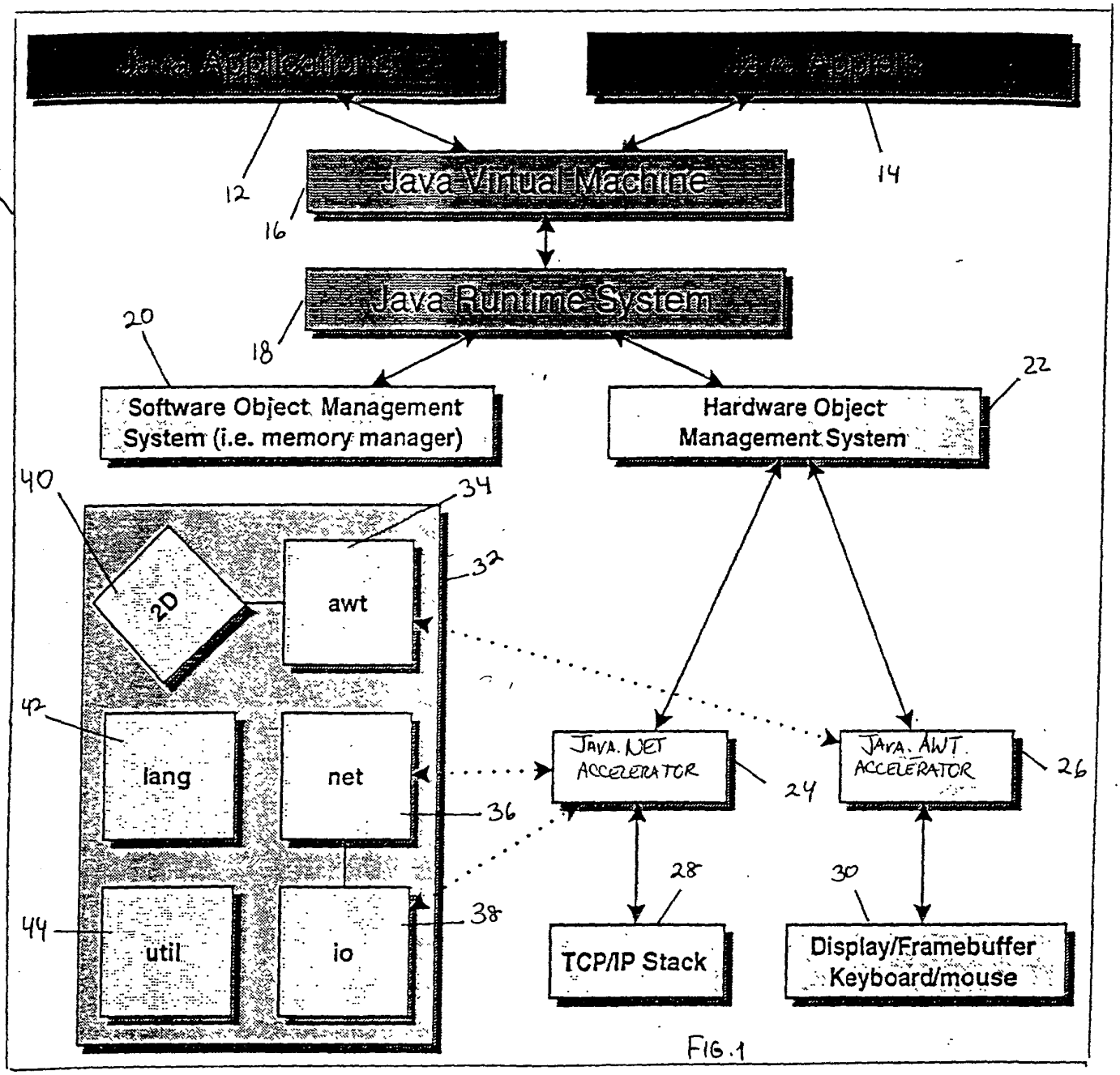
Java Applications
Java Applets
Java Virtual Machine
Java Runtime System
Software Object Management System (i.e. memory manager)
Hardware Object Management System
2D
awt
lang
net
util
io
JAVA.NET ACCELERATOR
JAVA.AWT ACCELERATOR
TCP/IP Stack
Display/Framebuffer Keyboard/mouse
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44

FIG. 1

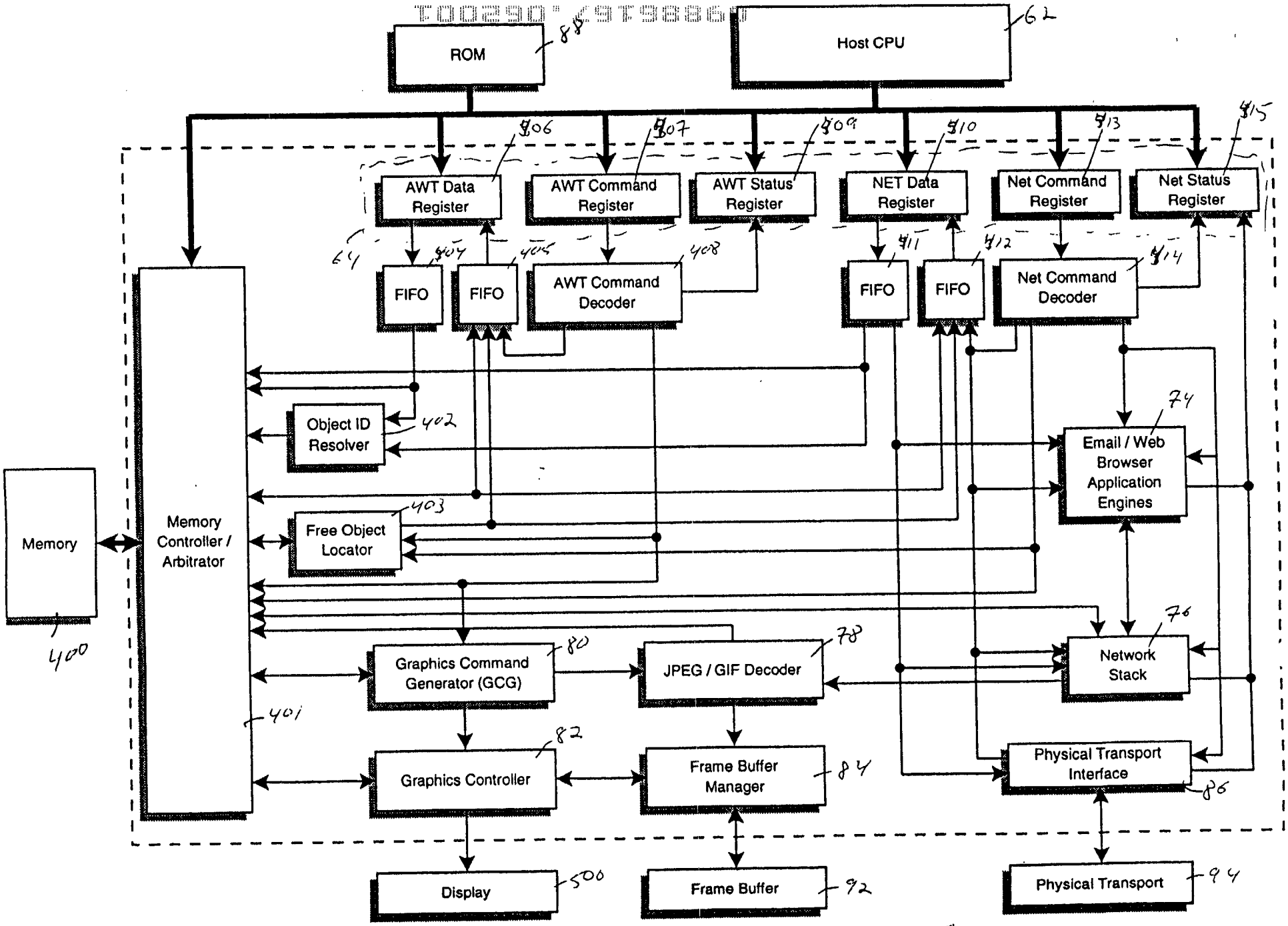
ROM
Host CPU
AWT Data Register
AWT Command Register
AWT Status Register
NET Data Register
Net Command Register
Net Status Register
FIFO
FIFO
AWT Command Decoder
FIFO
FIFO
Net Command Decoder
Object ID Resolver
Free Object Locator
Memory
Memory Controller / Arbitrator
Email / Web Browser Application Engines
Graphics Command Generator (GCG)
JPEG / GIF Decoder
Network Stack
Graphics Controller
Frame Buffer Manager
Physical Transport Interface
Display
Frame Buffer
Physical Transport

Fig. 2

T00290 "29T98860

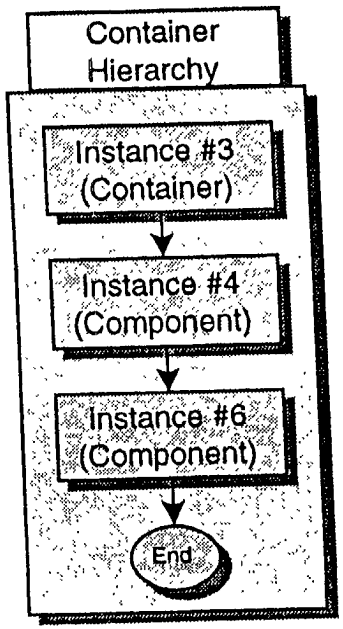

Fig. 4

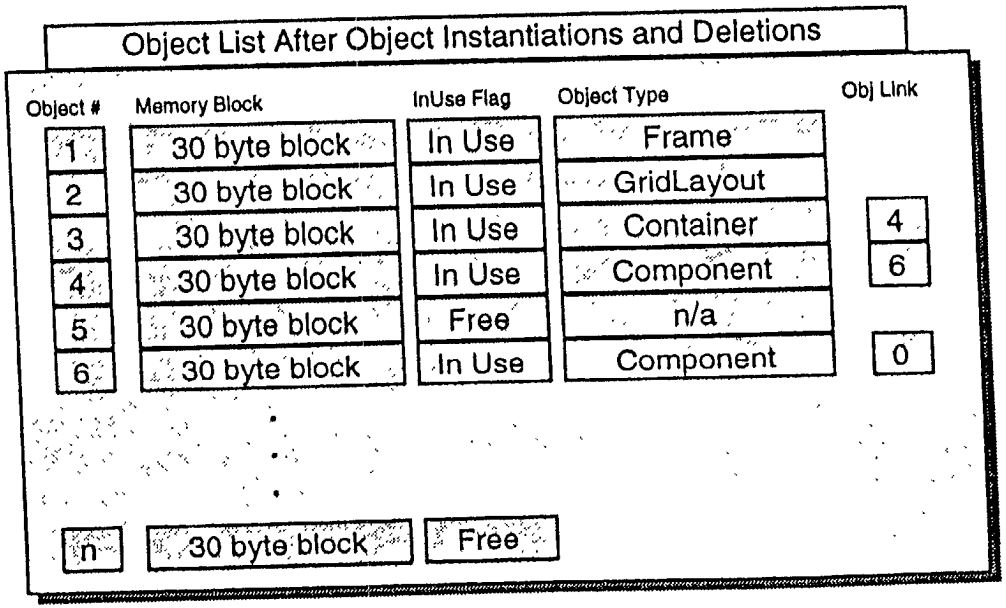

Fig 3

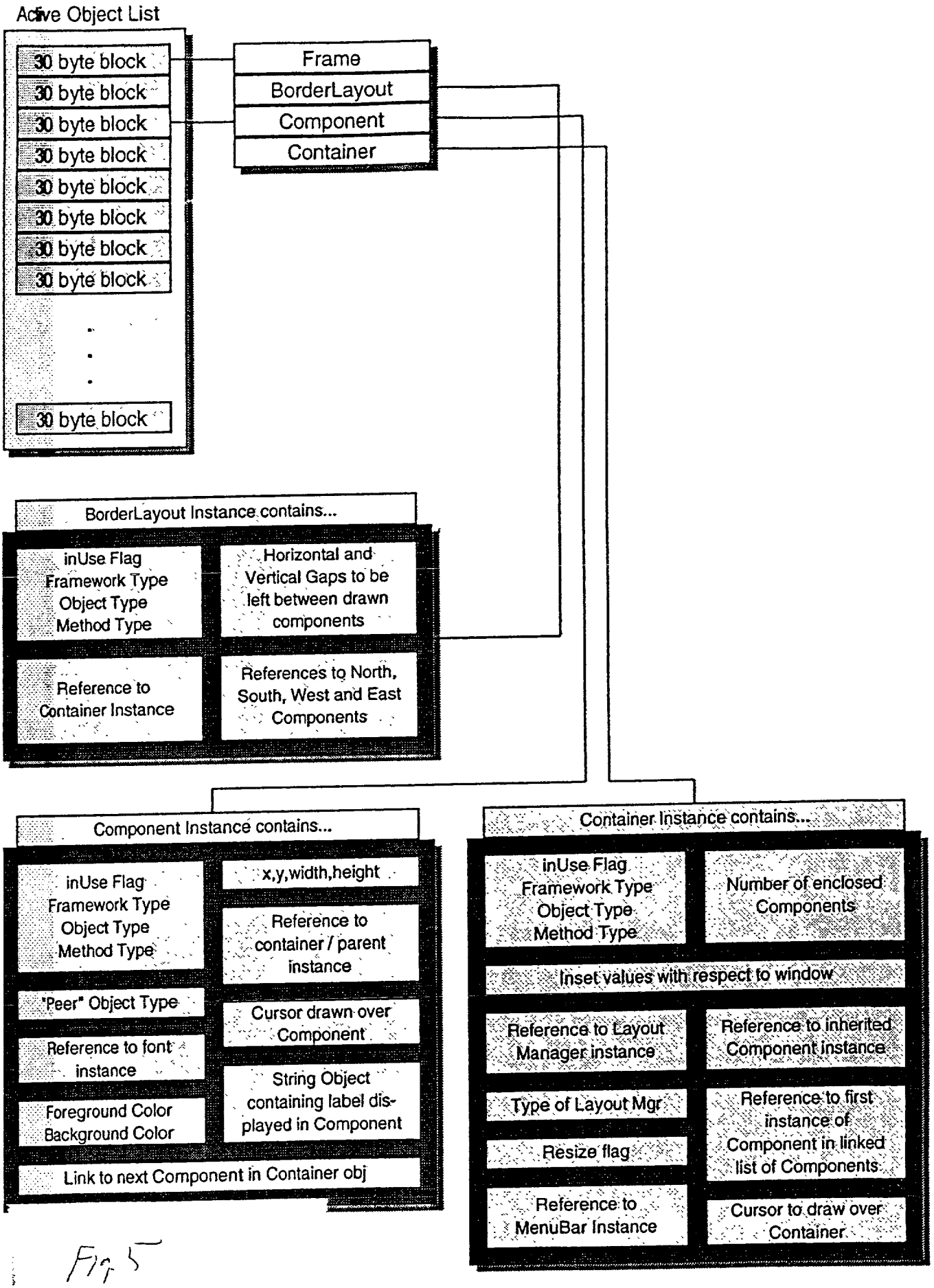
Active Object List
30 byte block
30 byte block
30 byte block
30 byte block
30 byte block
30 byte block
30 byte block
30 byte block
Frame
BorderLayout
Component
Container
BorderLayout Instance contains...
inUse Flag
Framework Type
Object Type
Method Type
Horizontal and Vertical Gaps to be left between drawn components
Reference to Container Instance
References to North, South, West and East Components
Component Instance contains...
inUse Flag
Framework Type
Object Type
Method Type
x,y,width,height
Reference to container / parent instance
"Peer" Object Type
Cursor drawn over Component
Reference to font instance
String Object containing label displayed in Component
Foreground Color
Background Color
Link to next Component in Container obj
Container Instance contains...
inUse Flag
Framework Type
Object Type
Method Type
Number of enclosed Components
Inset values with respect to window
Reference to Layout Manager instance
Reference to inherited Component instance
Type of Layout Mgr
Reference to first instance of Component in linked list of Components
Resize flag
Reference to MenuBar Instance
Cursor to draw over Container

Fig 5

DOCKET NO. 050205

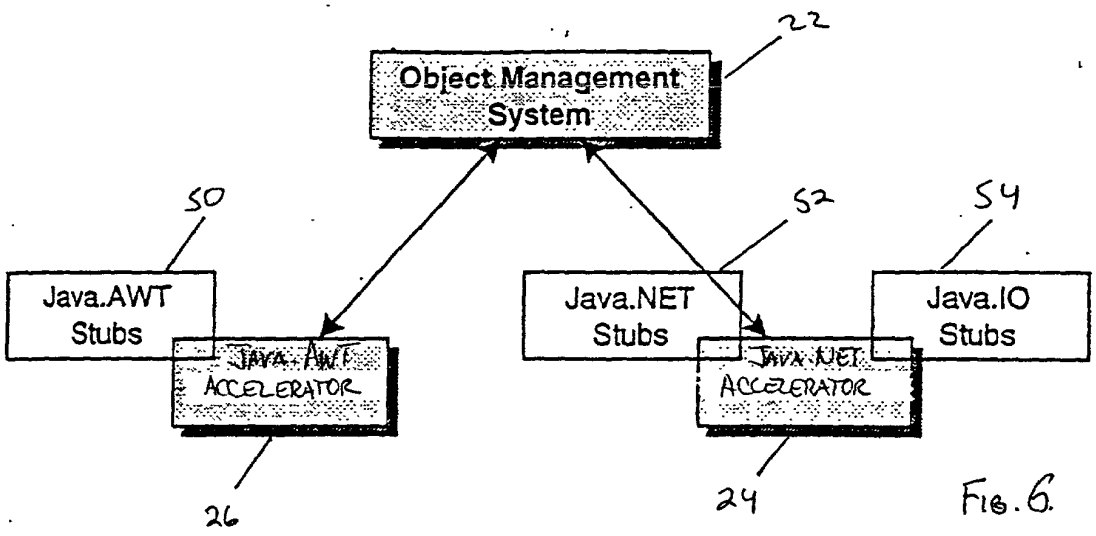

FIG. 6.

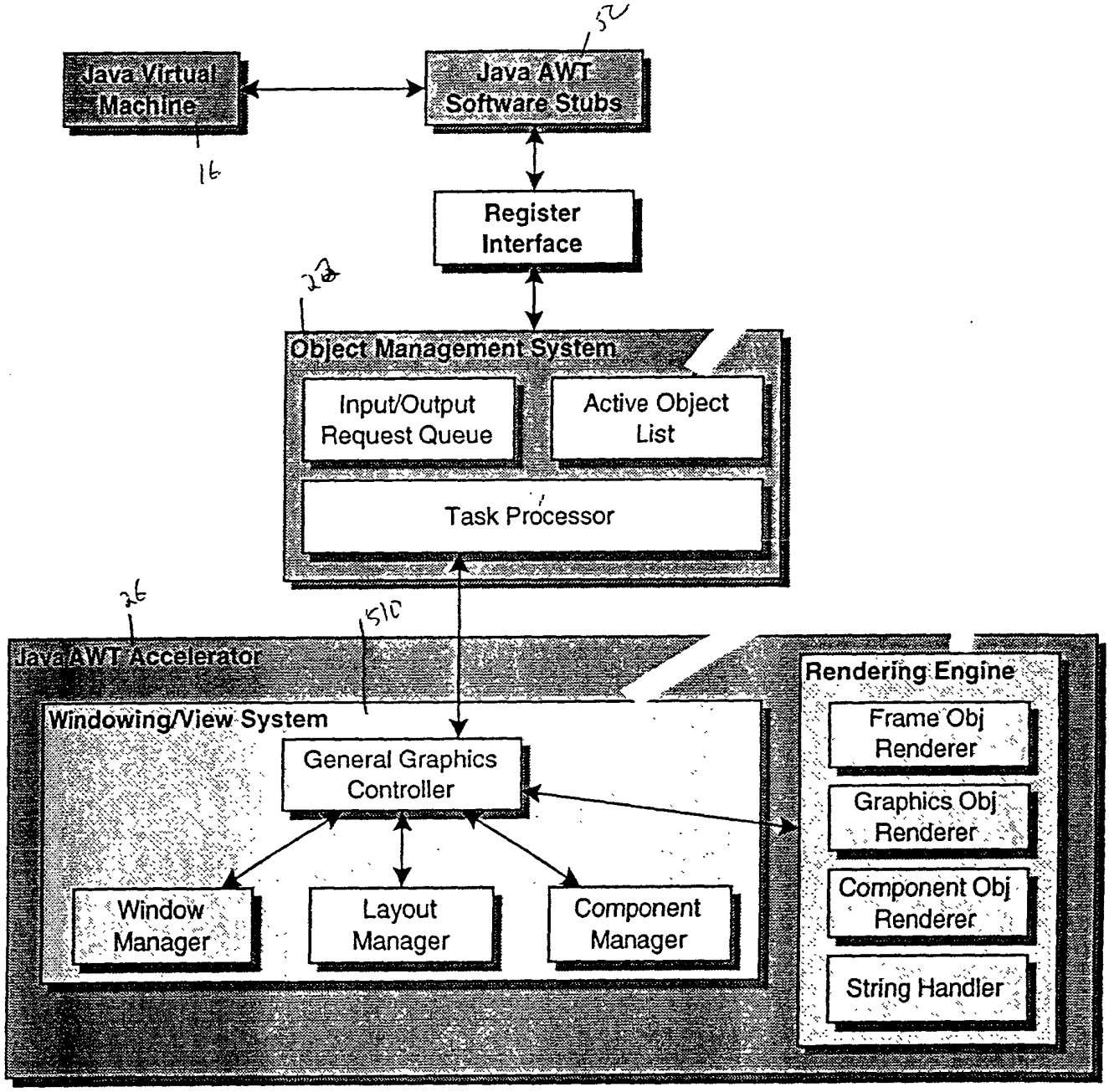
Java Virtual Machine
16
Java AWT Software Stubs
32
Register Interface
Object Management System
Input/Output Request Queue
Active Object List
Task Processor
26
510
Java AWT Accelerator
Windowing/View System
General Graphics Controller
Window Manager
Layout Manager
Component Manager
Rendering Engine
Frame Obj Renderer
Graphics Obj Renderer
Component Obj Renderer
String Handler

Fig 7

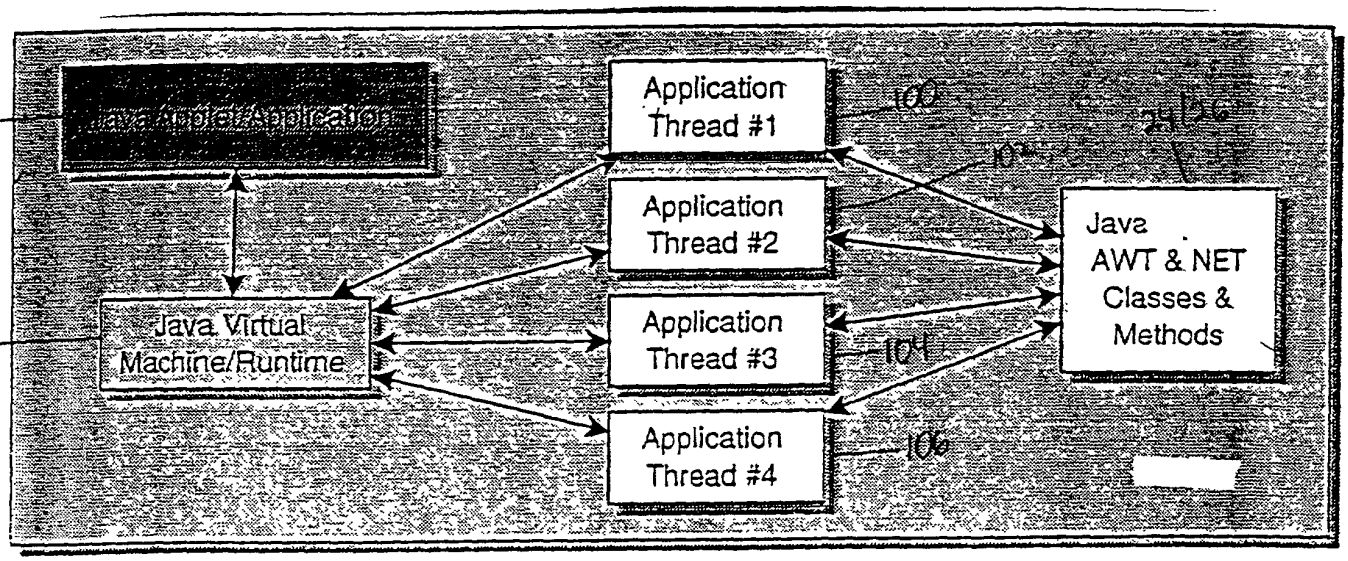
Java Applet/Application
Application Thread #1
Application Thread #2
Application Thread #3
Application Thread #4
Java Virtual Machine/Runtime
Java AWT & NET Classes & Methods
12/14
16/18
100
102
104
106
24/26

Fig. 8

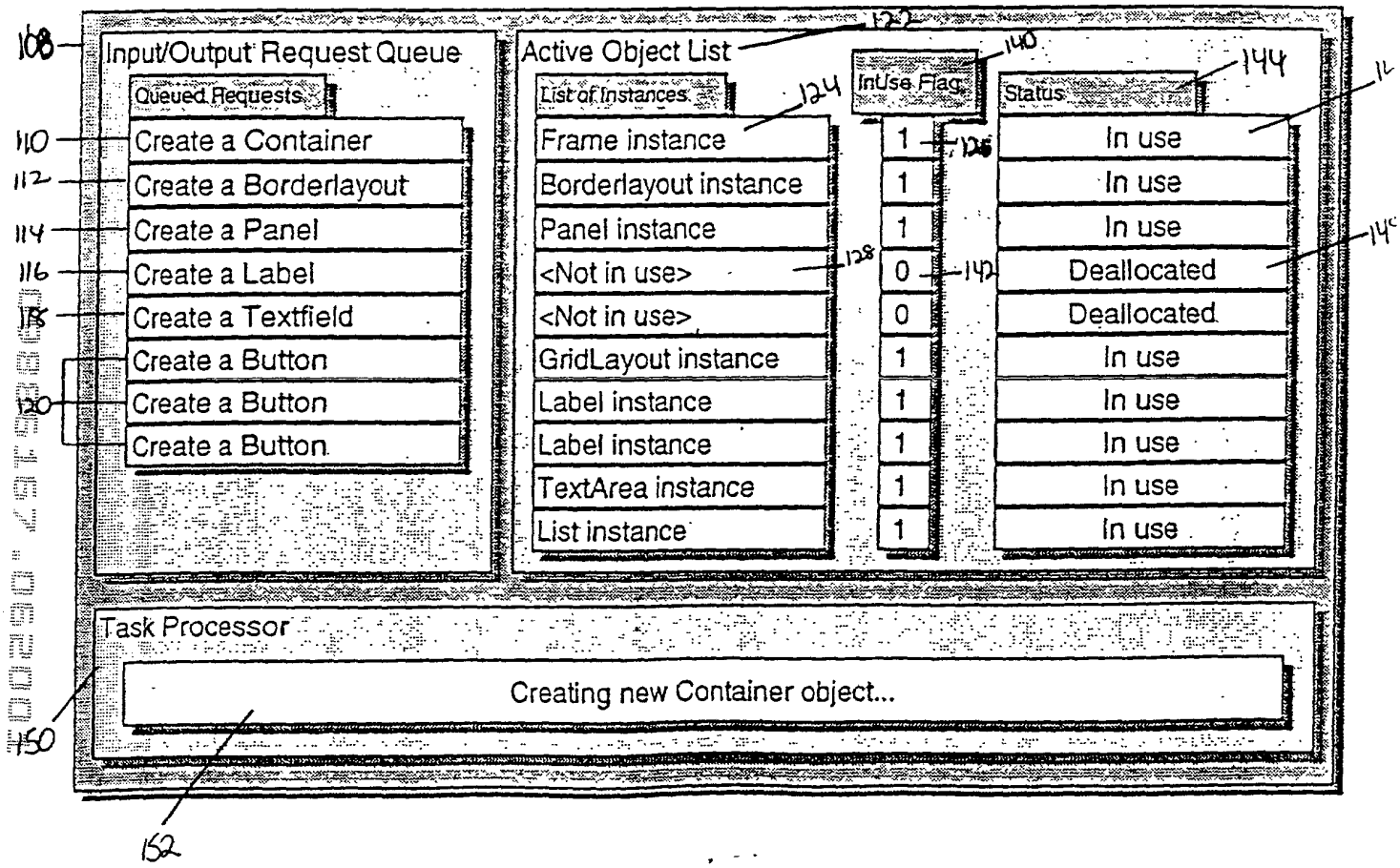
108
Input/Output Request Queue
Queued Requests
110 Create a Container
112 Create a Borderlayout
114 Create a Panel
116 Create a Label
118 Create a Textfield
Create a Button
120 Create a Button
Create a Button
122
Active Object List
List of Instances
124
InUse Flag
140
Status
144
Frame instance 1 In use
Borderlayout instance 1 In use
Panel instance 1 In use
<Not in use> 128 0 142 Deallocated
<Not in use> 0 Deallocated
GridLayout instance 1 In use
Label instance 1 In use
Label instance 1 In use
TextArea instance 1 In use
List instance 1 In use
Task Processor
150
Creating new Container object...
152

Fig 9

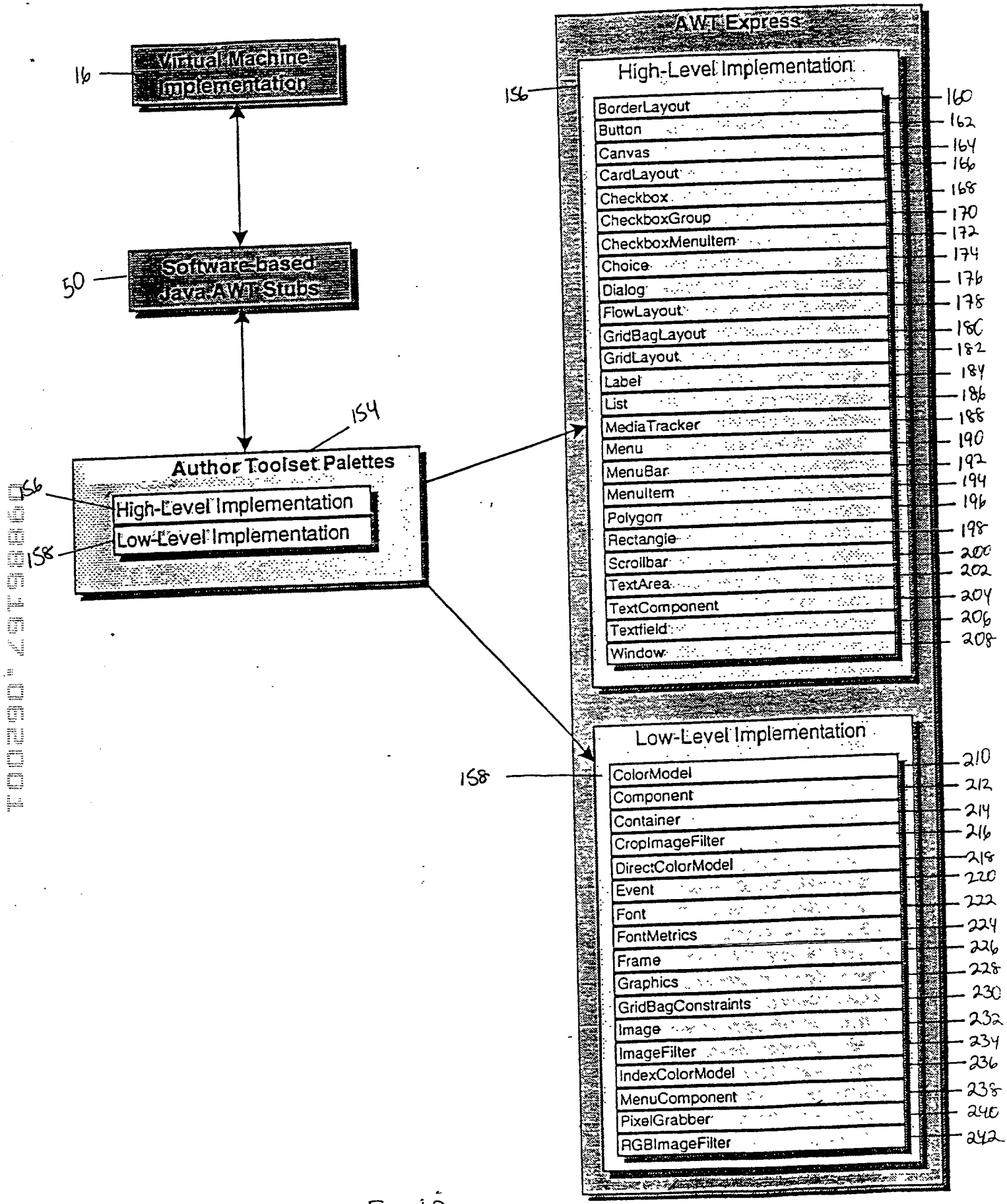
Virtual Machine Implementation
16
Software-based Java AWT Stubs
50
Author Toolset Palettes
154
156
High-Level Implementation
158
Low-Level Implementation
AWT Express
156
High-Level Implementation
BorderLayout
Button
Canvas
CardLayout
Checkbox
CheckboxGroup
CheckboxMenuItem
Choice
Dialog
FlowLayout
GridBagLayout
GridLayout
Label
List
MediaTracker
Menu
MenuBar
MenuItem
Polygon
Rectangle
Scrollbar
TextArea
TextComponent
Textfield
Window
160
162
164
166
168
170
172
174
176
178
180
182
184
186
188
190
192
194
196
198
200
202
204
206
208
158
Low-Level Implementation
ColorModel
Component
Container
CropImageFilter
DirectColorModel
Event
Font
FontMetrics
Frame
Graphics
GridBagConstraints
Image
ImageFilter
IndexColorModel
MenuComponent
PixelGrabber
RGBImageFilter
210
212
214
216
218
220
222
224
226
228
230
232
234
236
238
240
242

FIG. 10

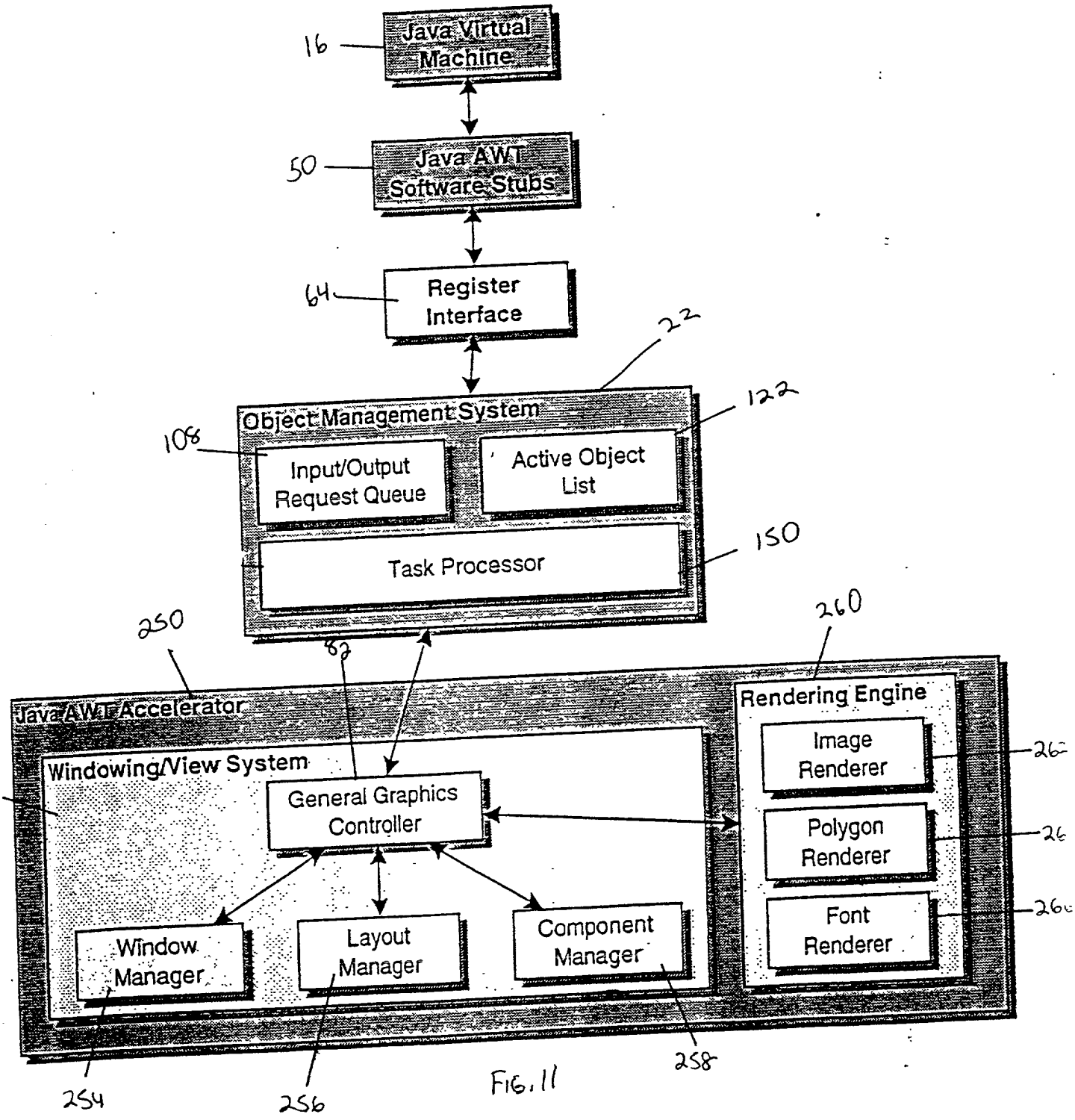
16
Java Virtual Machine
50
Java AWT Software Stubs
64
Register Interface
22
Object Management System
122
108
Input/Output Request Queue
Active Object List
150
Task Processor
250
260
87
Java AWT Accelerator
Rendering Engine
Windowing/View System
General Graphics Controller
Image Renderer
Polygon Renderer
Font Renderer
Window Manager
Layout Manager
Component Manager
252
254
256
258

Fig. 11

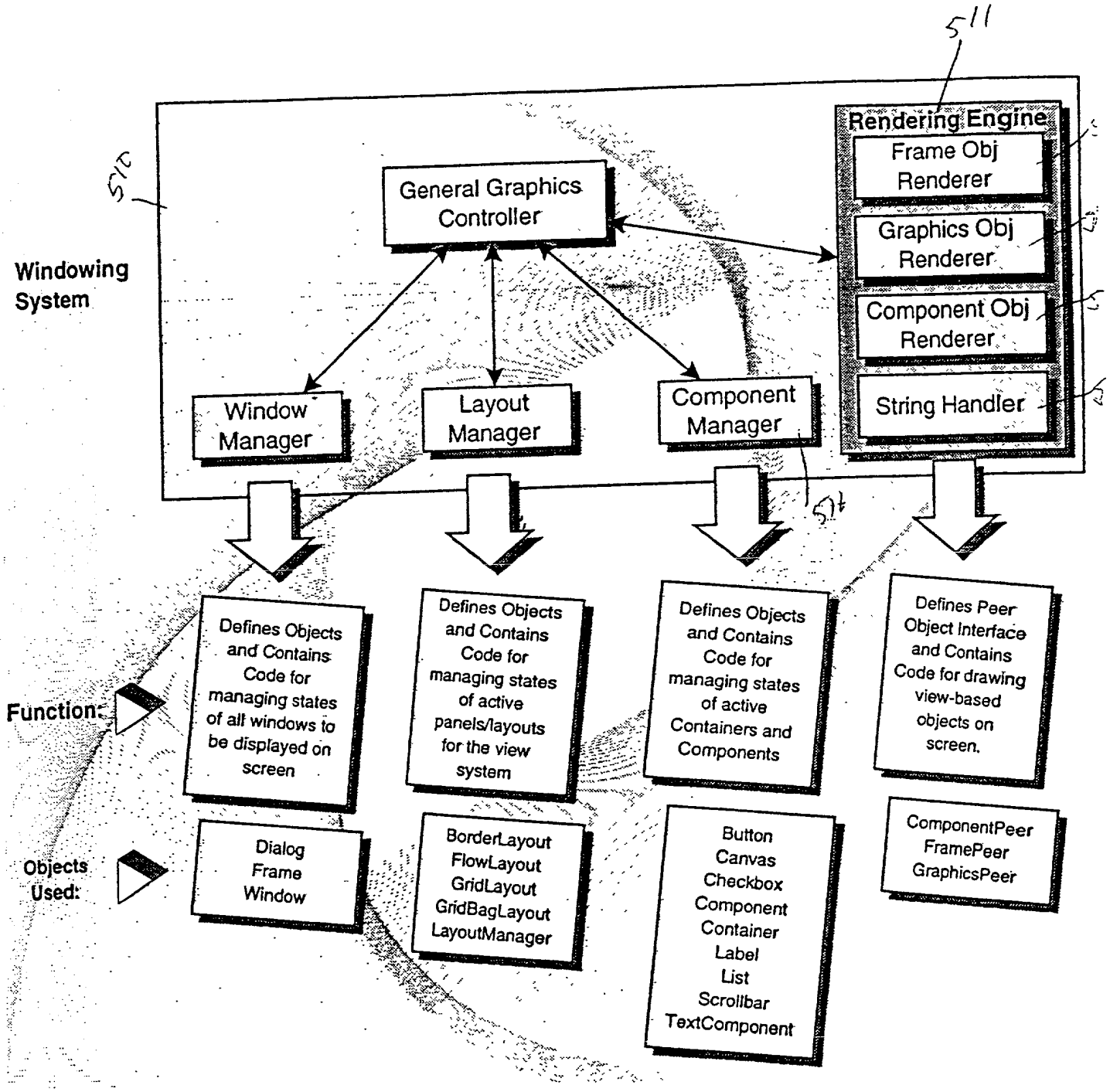
511
Rendering Engine
Frame Obj Renderer
Graphics Obj Renderer
Component Obj Renderer
String Handler
512
General Graphics Controller
Windowing System
Window Manager
Layout Manager
Component Manager
514
Function:
Defines Objects and Contains Code for managing states of all windows to be displayed on screen
Defines Objects and Contains Code for managing states of active panels/layouts for the view system
Defines Objects and Contains Code for managing states of active Containers and Components
Defines Peer Object Interface and Contains Code for drawing view-based objects on screen.
Objects Used:
Dialog
Frame
Window
BorderLayout
FlowLayout
GridLayout
GridBagLayout
LayoutManager
Button
Canvas
Checkbox
Component
Container
Label
List
Scrollbar
TextComponent
ComponentPeer
FramePeer
GraphicsPeer

Fig. 12

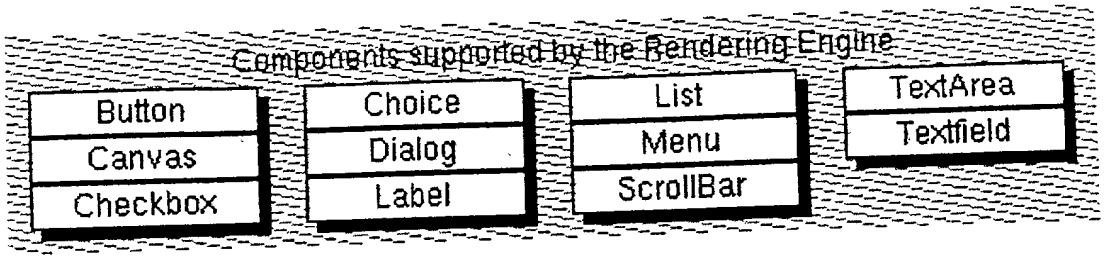
Components supported by the Rendering Engine
Button
Canvas
Checkbox
Choice
Dialog
Label
List
Menu
ScrollBar
TextArea
Textfield

Fig 13

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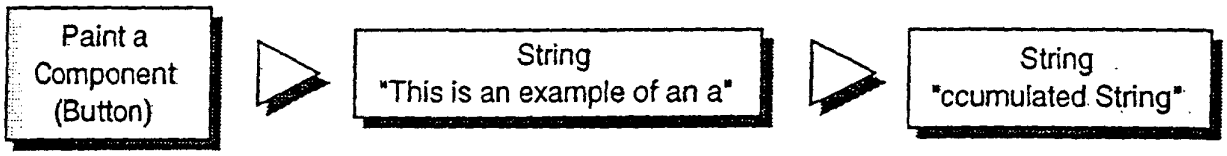
The commands:



The result:

Fig. 14

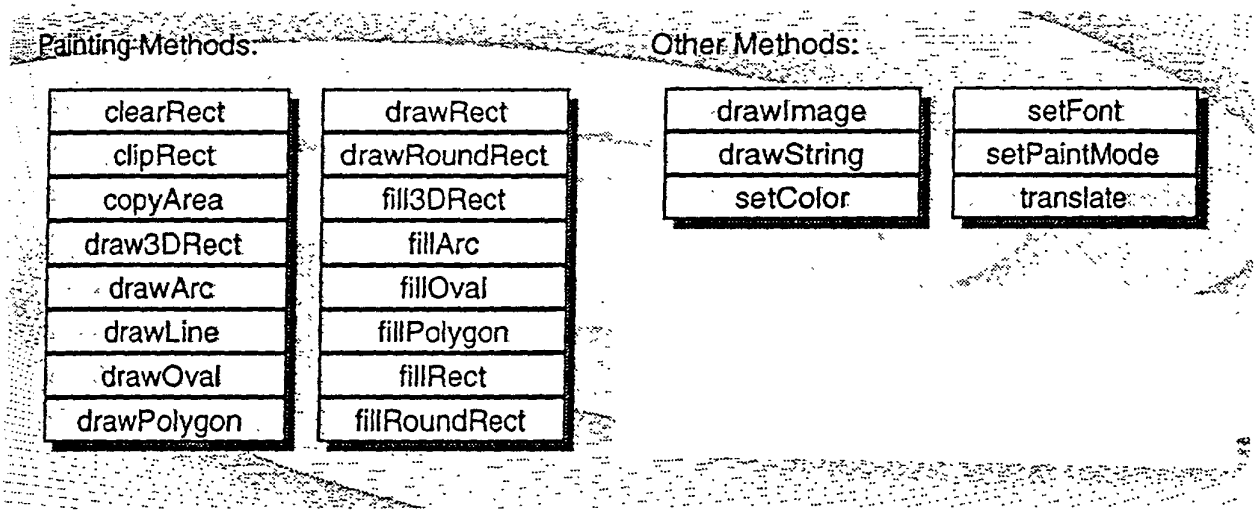


Fig. 15

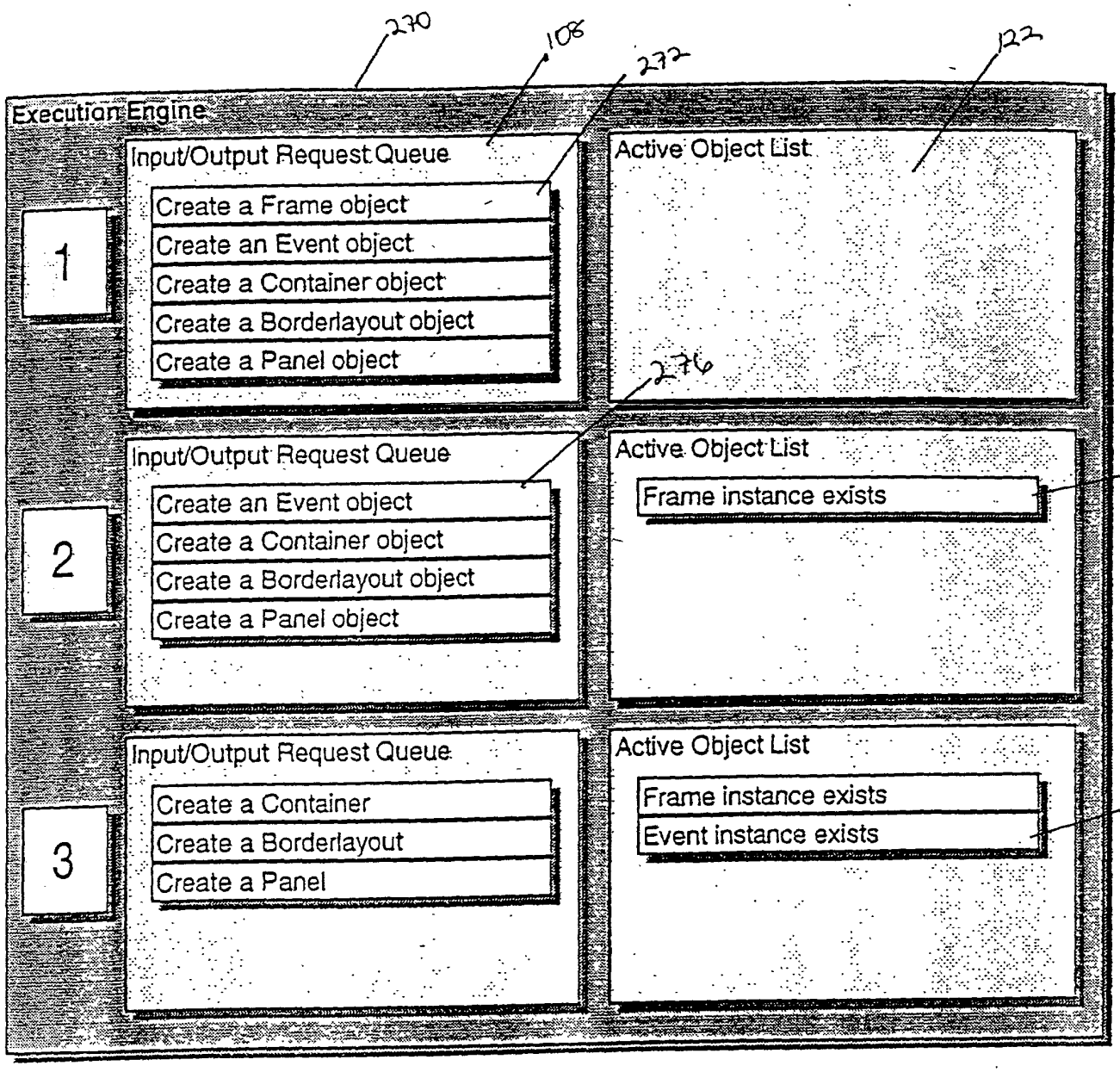

270
108
272
122
Execution Engine
Input/Output Request Queue
Create a Frame object
Create an Event object
Create a Container object
Create a Borderlayout object
Create a Panel object
Active Object List
1
276
Input/Output Request Queue
Create an Event object
Create a Container object
Create a Borderlayout object
Create a Panel object
Active Object List
Frame instance exists
2
Input/Output Request Queue
Create a Container
Create a Borderlayout
Create a Panel
Active Object List
Frame instance exists
Event instance exists
3

FIG. 16

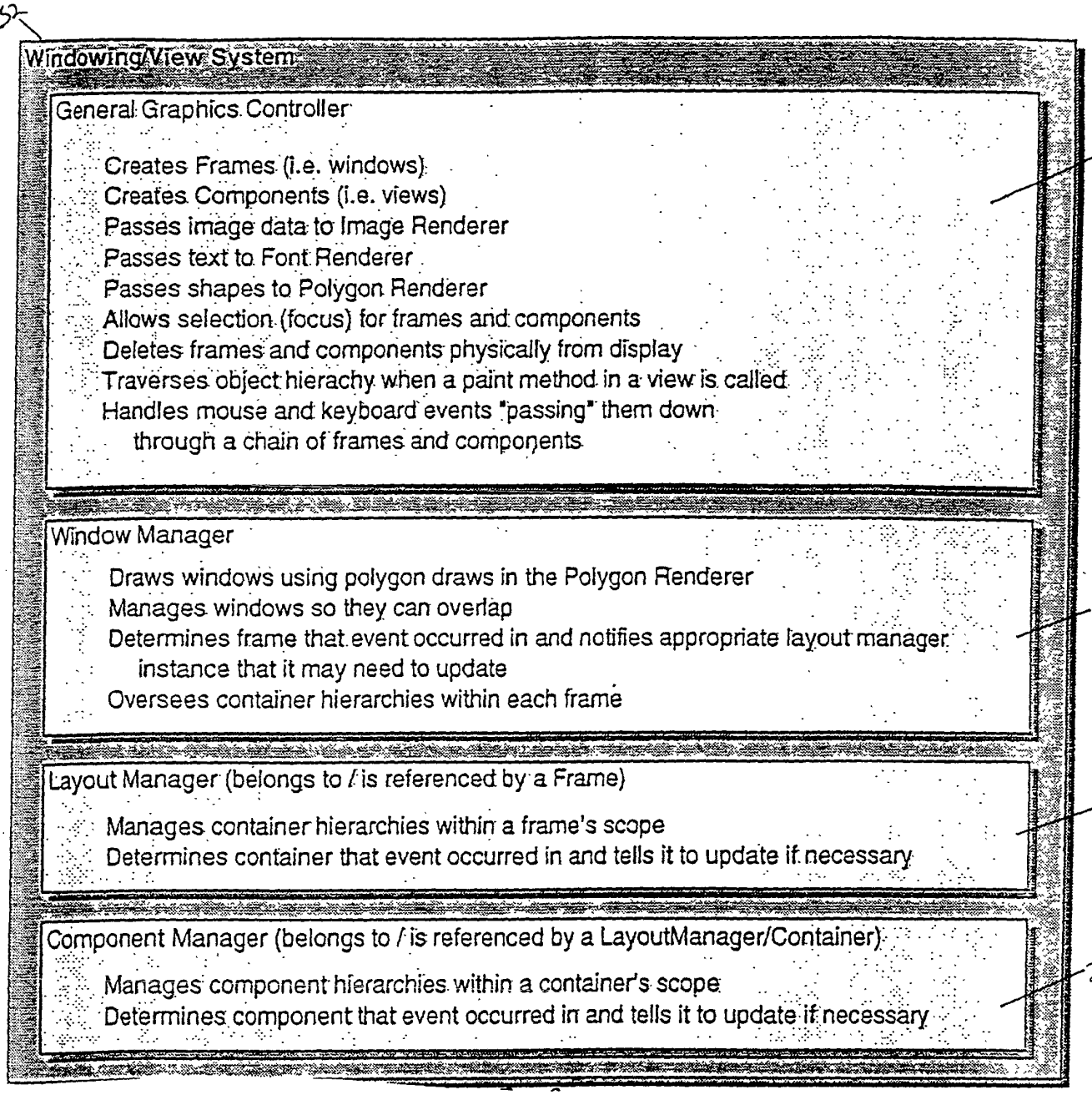

252
Windowing/View System
General Graphics Controller
Creates Frames (i.e. windows)
Creates Components (i.e. views)
Passes image data to Image Renderer
Passes text to Font Renderer
Passes shapes to Polygon Renderer
Allows selection (focus) for frames and components
Deletes frames and components physically from display
Traverses object hierachy when a paint method in a view is called
Handles mouse and keyboard events "passing" them down through a chain of frames and components
Window Manager
Draws windows using polygon draws in the Polygon Renderer
Manages windows so they can overlap
Determines frame that event occurred in and notifies appropriate layout manager instance that it may need to update
Oversees container hierarchies within each frame
Layout Manager (belongs to / is referenced by a Frame)
Manages container hierarchies within a frame's scope
Determines container that event occurred in and tells it to update if necessary
Component Manager (belongs to / is referenced by a LayoutManager/Container)
Manages component hierarchies within a container's scope
Determines component that event occurred in and tells it to update if necessary

FIG. 17

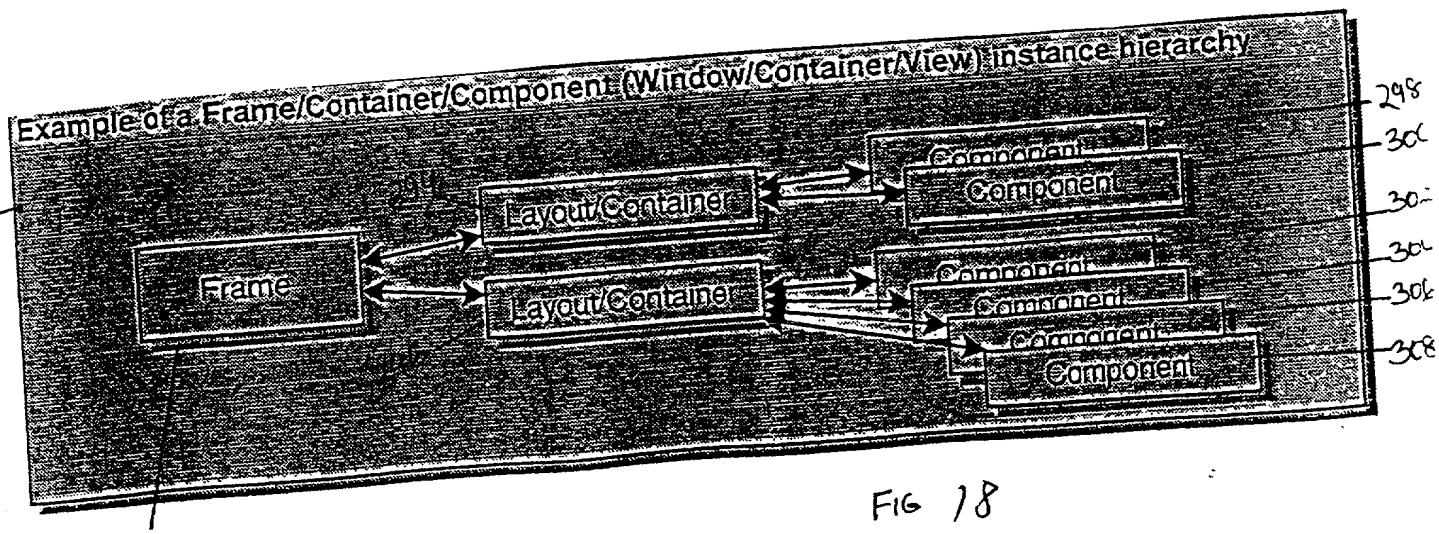

Example of a Frame/Container/Component (Window/Container/View) instance hierarchy
290
294
Frame
Layout/Container
Layout/Container
Component
Component
Component
Component
Component
298
300
302
304
306
308
292

FIG 18

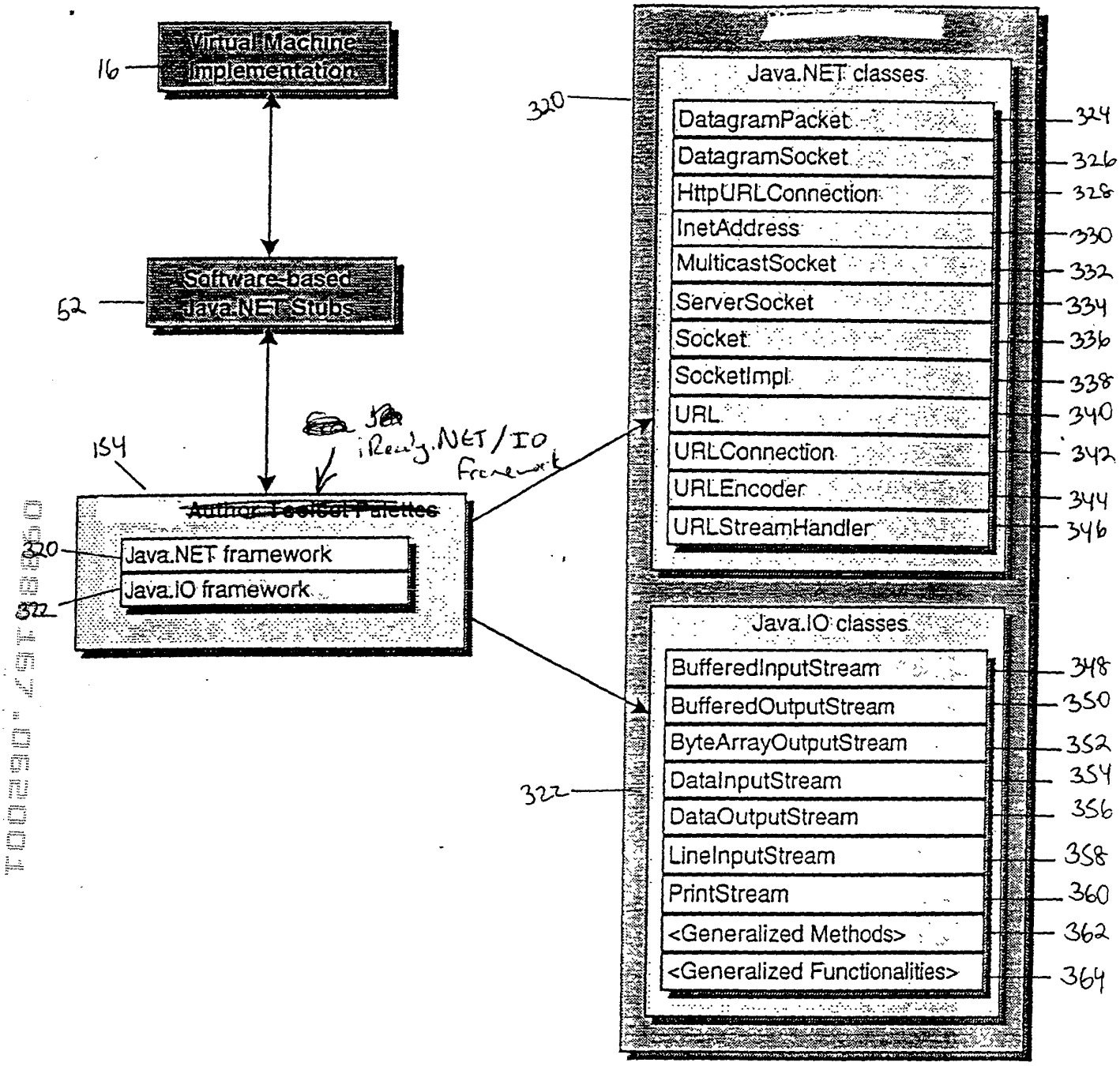

Virtual Machine Implementation
16
Software-based Java.NET Stubs
52
154
Java.NET framework
Java.IO framework
320
322
Java.NET classes
DatagramPacket
DatagramSocket
HttpURLConnection
InetAddress
MulticastSocket
ServerSocket
Socket
SocketImpl
URL
URLConnection
URLEncoder
URLStreamHandler
324
326
328
330
332
334
336
338
340
342
344
346
Java.IO classes
BufferedInputStream
BufferedOutputStream
ByteArrayOutputStream
DataInputStream
DataOutputStream
LineInputStream
PrintStream
<Generalized Methods>
<Generalized Functionalities>
348
350
352
354
356
358
360
362
364

Fig 19

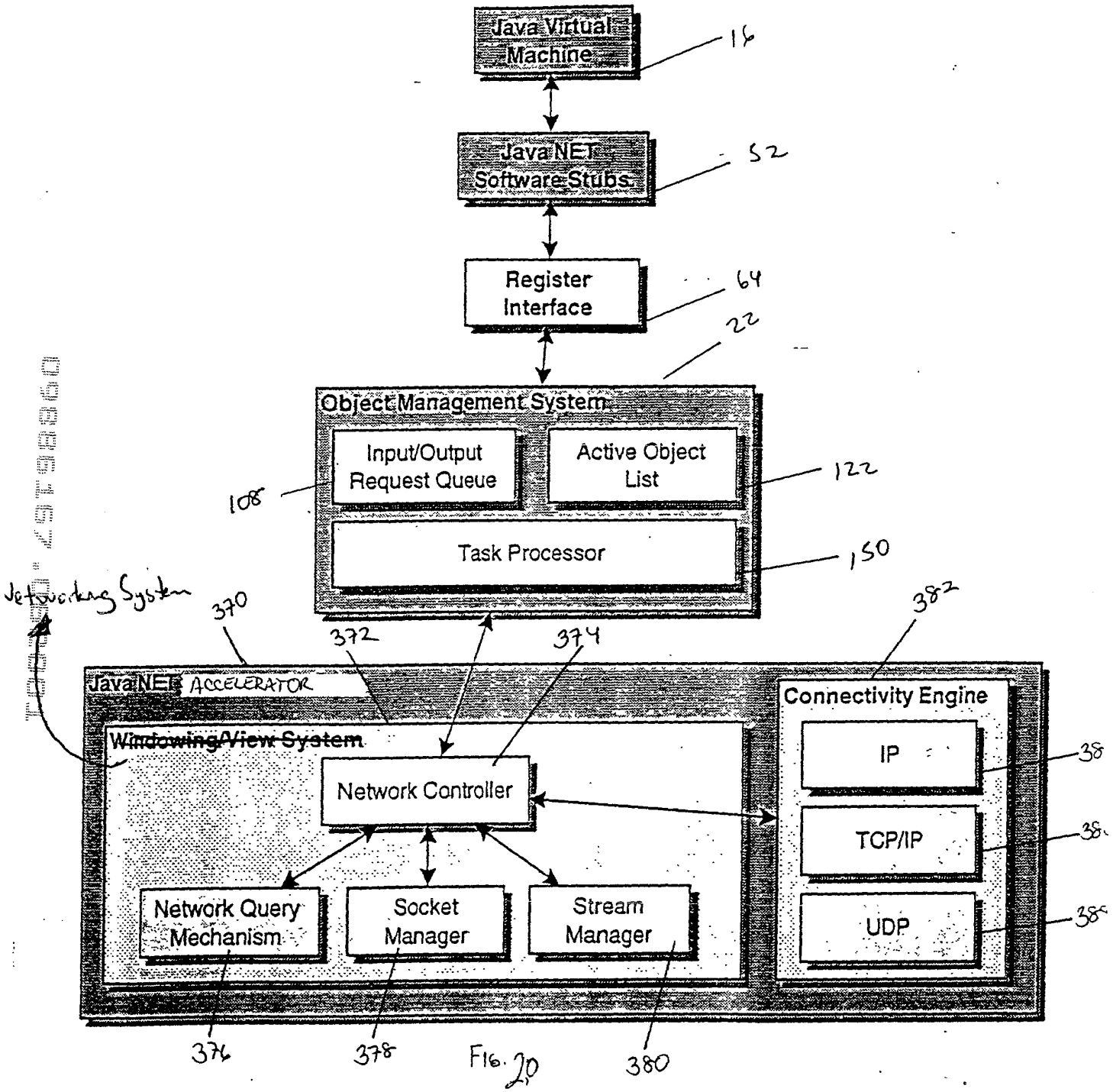

Java Virtual Machine
16
Java.NET Software Stubs
52
Register Interface
64
22
Object Management System
Input/Output Request Queue
Active Object List
122
108
Task Processor
150
Networking System
370
372
374
382
Java.NET ACCELERATOR
Windowing/View System
Network Controller
Connectivity Engine
IP
TCP/IP
UDP
Network Query Mechanism
Socket Manager
Stream Manager
376
378
380

FIG. 20

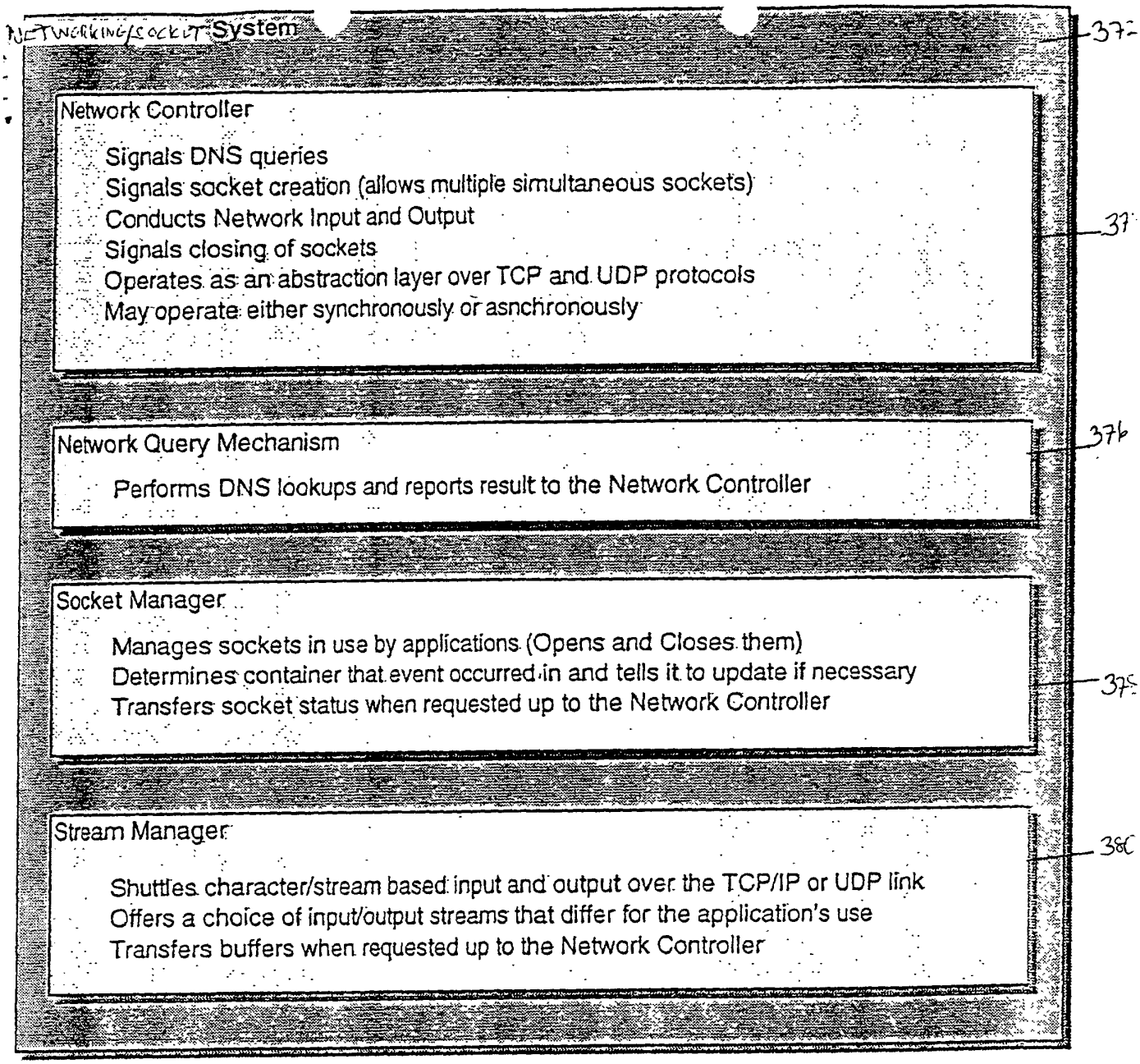

NETWORKING/SOCKET System
37
Network Controller
Signals DNS queries
Signals socket creation (allows multiple simultaneous sockets)
Conducts Network Input and Output
Signals closing of sockets
Operates as an abstraction layer over TCP and UDP protocols
May operate either synchronously or asnchronously
37
Network Query Mechanism
Performs DNS lookups and reports result to the Network Controller
37b
Socket Manager
Manages sockets in use by applications (Opens and Closes them)
Determines container that event occurred in and tells it to update if necessary
Transfers socket status when requested up to the Network Controller
37c
Stream Manager
Shuttles character/stream based input and output over the TCP/IP or UDP link
Offers a choice of input/output streams that differ for the application's use
Transfers buffers when requested up to the Network Controller
38c

FIG. 2J